

Adaptive Bioassistive and Telerobotic Devices for Human-Robotic Systems, Phase I

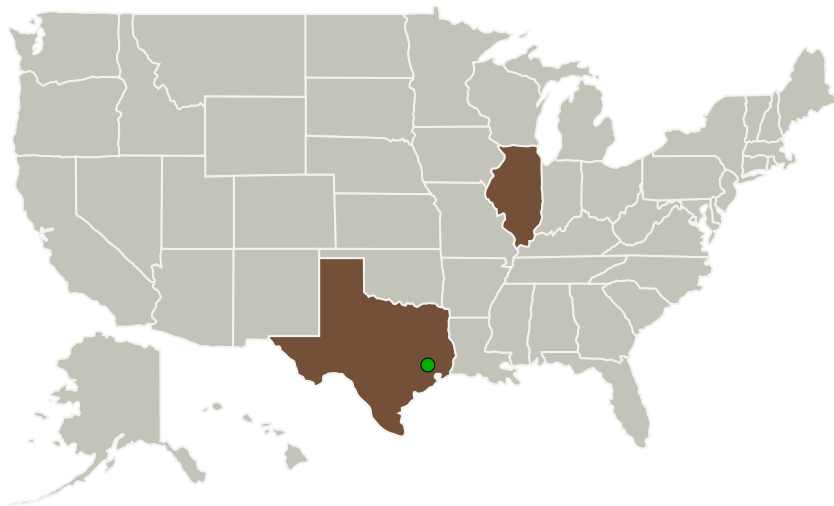
Completed Technology Project (2012 - 2012)



Project Introduction

CU Aerospace and team partner, the University of Illinois at Urbana-Champaign, propose to perform innovative research and development that targets the design and control of adaptive bioassistive and telerobotic devices - ABATRODs - that augment normal musculoskeletal function in rapidly changing and disruptive environments while providing predictable response. ABATRODs accommodate fast changes in environment while actively shaping the response to muscle actuation to that anticipated by the operator, allowing the operator to maintain focus on task objectives. The ABATROD architecture uses principles of L1 adaptive control to decouple the task of adaptation and environmental uncertainty from the operator perceived response, thereby enabling the design of a range of apparently nonintrusive augmenting and telerobotic device technologies. The L1 paradigm significantly widens the domain of safe operation within which operator-induced instability can be eliminated without tuning. This effort makes innovative contributions to NASA-relevant space exploration tasks: (i) sustained and accurate manipulation of physical control interfaces on machinery and vehicles by an operator on a shaking space vehicle or rover, (ii) the stable and coordinated handling of scientific or photographic hardware by an astronaut during ambulation across uneven terrain, and (iii) the precise and reliable control of telerobotic devices for robotic-EVAs in unpredictable conditions.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
CU Aerospace, LLC	Lead Organization	Industry	Champaign, Illinois
● Johnson Space Center(JSC)	Supporting Organization	NASA Center	Houston, Texas

Primary U.S. Work Locations	
Illinois	Texas

Project Transitions

▶ **February 2012:** Project Start

✓ **August 2012:** Closed out

Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/137950>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

CU Aerospace, LLC

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

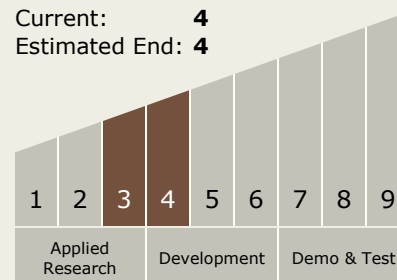
Carlos Torrez

Principal Investigator:

David L Carroll

Technology Maturity (TRL)

Start: **3**
Current: **4**
Estimated End: **4**



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Technology Areas

Primary:

- TX04 Robotic Systems
 - └ TX04.4 Human-Robot Interaction
 - └ TX04.4.3 Remote Interaction

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System